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MEMORANDUM FOR: See Distribution

SUBJECT: Progress Report on Packaging for Underground Burial

REFERENCE: Memorandum for Chiefs, WE, EE, FE, NE, LA, SP and Training Division, Chief II IMA, and Chief of Procurement, from Chairman, Research & Development Review Board, subject "Progress Report on a Method for Packaging for Underground Storage," dated 4 January 1951.

1. The referenced memorandum was written to present what was then considered to be the best methods for packaging for underground storage using materials immediately available. This memorandum stated that in the opinion of packaging experts consulted the Hot Dip Method (Strippable Protective Compound, JAN-C-149) and the Foil Wrap Method (heat sealable Flexible Moisture-Vaporproof Barrier-Material MIL-B-131) could be used for packaging items to withstand exposure under burial conditions.

2. Subsequent to the referenced memorandum MB/OTS performed accelerated burial tests of rifles packaged by the Hot Dip and Foil Wrap Method. Under the Hot Dip Method both cellulose-acetate-butyrate and ethyl cellulose formulations were used. Several types of barrier materials were tested under the foil wrap method. These consisted of the standard MIL-B-131 cloth backed.Flexible Water Vaporproof Barrier Material, two similar barrier-materials backed with fungus treated cloth, and a barrier material having a fiberglass cloth backing.

The overall test program consisted of three separate 6-week tests; tropical (day 85°F 90% RH, Night 75° F 95% RH), cyclic (-30° F to 130° F), and water submersion (room temp.) In addition a mixed fungus spore suspension was applied to samples of the two types of Strippable Protective Compound. These samples were then bur

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conditions. The tests showed that the Hot Dip Method gave excellent protection to metallic objects such as rifles during burial. Of the two types of hot dip compounds the cellulose-acetate-butyrate formulation was more fungus resistant than the ethycellulose formulation.

The only difficulty experienced with the Foil Wrap Method during the tests was under the water submersion tests, where improper sealing did not give the material a proper opportunity for success. Under tropical and cyclic burial conditions the barrier materials satisfactorily protected the packaged items, although in the case of the MIL-B-131B barrier material the cloth backing had supported fungi or bacteria and the backing material had decayed.

3. Based upon the above tests, it was decided that for burial of metallic objects such as guns and side arms, the Hot Dip Method should be employed using the cellulose-acetate-butyrate formulation. Due to the dipping temperatures between 350° F and 380° F the Hot Dip Method was limited to items that could withstand these temperatures for a short period of time. Therefore this method could not be recommended for items of an explosive or incendiary nature. Also as cellulose-acetate-butyrate formulation is not a perfect moisture vapor barrier, the hot dip method could not be recommended for packaging items having a great number of large irregularities, or void spaces. In lieu of the above restrictions on the Hot Dip Method there still was a need for Foil Wrap Method packaging. It was decided that the present MIL-B-131B material was not the perfect burial material due to decaying of the cloth backing and the fact that it was susceptable to damage with rough handling. The other barrier materials tested were specially laminated and did not seem satisfactory

in enough aspects to recommend for procurement. CONFIDENTIAL

4. The Dept. of Army was given the task of developing a barrier-material suitable for packaging for underground burial. Subsequently the Dept. of Ordnance developed two prototyp barrier materials. One type consisted of two layers of foil with a fiberglass cloth backing, while the other barrier-material consisted of two layers of foil and two layers of"fiber thin" nylon cloth. These two barrier materials were subjected to the moisture vapor transmission tests and the cyclic exposure test (with rough handling) described in Military Specification MIL-B-131. The barrier material backed with fiberglass cloth was found unsatisfactory under the cyclic exposure test and further tests on this material under MIL-B-131 were discontinued. Moisture vapor transmission tests on the "fiber thin" nylon cloth backed barrier material gave results so low that they were beyond the realm of accuracy of the instruments. This material when submitted to the cyclic exposure tests gave results that were lower than those of any previous similar material that the Department of Ordnance had tested. Maximum allowible for similar material under the cyclic exposure test is 10% pick-up on 15% total. The "fiber thin" nylon bakced barrier material was tested with 5 to 5½% moisture content (absolute-anhydrous-base of desicant contained) at the start, and concluded with 5.42, 5.95, 7.09, and 6.07 per cents.

5. The fiberglass cloth backed barrier material and the "fiber thin" nylon backed barrier material were subjected to accelerated burial tests similar to those described in paragraph 2, above. The fiberglass cloth backed barrier material gave good results; while the "fiber thin" nylon backed barrier material gave results that could be classed as excellent under burial conditions. The only exception to the results occured in

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the submersion tests where scarcity of test material caused improper sealing and leaks. During the burial period no decay of the nylon backing could be observed, although the material did not have quite as high a tear resistance after burial.

6. Specifications for procurement of the "fiber thin" nylon backed barrier material are being prepared. When these specifications are completed, they will be immediately turned over to the Procurement Office.

7. Development is currently being carried out on two types of containers for burial. The first is a rubberized fabric bag for carrying groups of items, individually packaged for burial, to and from the cash. The bag will also protect the packaged items from water and fungus during burial. Burial tests have proven that the bag is not a moisture vapor barrier. The rubberized fabric bag has the advantages of being extremely light, flexible, and capable of being fabricated in any desired size. The second container is a light rigid container of either stainless steel or aluminum. Stainless steel is preferred because of its superior corrosion resistance. The present prototype has the inside dimensions of 7 x 9 x 16½ inches. The container will weigh approximately 5 lbs, and have a latch type closure. The closure will be designed to accomplish a hermetic seal. However, the desire to have the container of minimum weight may limit the closure to being waterproof. With this assumption it will be recommended that all items susceptable to moisture vapor, that are to be packaged in the container, should first individually be packaged inside a moisture barrier. This should not provide a serious packaging problem as most items as produced are inside moisture barriers. The rigid container has a No. 1 priority in MB/TSS and will be designed and tested as soon as possible.